

# Notice of Allowability

Application No.

10/019,278

Examiner

Wesley D Markham

Applicant(s)

DELAUNAY ET AL.

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to applicant's amendment (2/13/04) and the attached examiner's amendment.
2. ☒ The allowed claim(s) is/are 27-40 and 57-59.
3. ☒ The drawings filed on 02 January 2002 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

- |   |  |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                                  |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date <u>attached</u> . |
| 3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date <u>2/13/04</u> | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment  |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material                              | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance                         |
|   | 9. <input type="checkbox"/> Other _____.   |

WDM

**EXAMINER'S AMENDMENT / ALLOWANCE**

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Ron Rudder on 4/30/2004.

The application has been amended as follows:

**In the claims:**

Claims 41 – 56 have been canceled.

**In the specification (and after entry of applicant's amendment of 2/13/2004):**

On page 8, line 13, the phrase, "pages 2320-2 24" has been amended to read, --pages 2320-2324--.

On page 19, between lines 11 and 12, the title "DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS" has been deleted.

On page 19, between lines 10 and 11, the title, --DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS-- has been inserted.

***Reasons for Allowance***

Claims 27 – 40 and 57 – 59 are allowed.

The following is an examiner's statement of reasons for allowance: To begin, acknowledgment is made of applicant's claim for foreign priority based on an application filed in France on 7/1/1999 (i.e., FR 99/08473), and a copy of the certified copy has been received in this National Stage (i.e., 371) Application. The formal drawings (4 sheets, 7 figures) filed by the applicant on 1/2/2002 are approved by the examiner. The IDS submitted by the applicant on 2/13/2004 has been considered by the examiner as indicated on the attached copy of the PTO-1449 form. Additionally, the objections to the specification and to Claims 27 – 29 and 36 set forth in paragraphs 7 – 11 of the previous Office Action (i.e., the non-final Office Action mailed on 10/21/2003) are withdrawn in light of the applicant's amendment filed on 2/13/2004. Further, the rejections of Claims 27 – 40 under 35 USC 112, second paragraph, set forth in paragraphs 15 – 18 of the previous Office Action, are withdrawn in light of the applicant's amendment, in which (1) the relative term "highly" was deleted from independent Claim 27, (2) the specific simultaneous steps were delineated in Claim 29, and (3) Claims 39 and 40 were amended to clarify that the "frame" is indeed an electrical ground.

As amended, independent Claim 27 (from which Claims 28 – 40 and 57 – 59 depend) is drawn to a process for depositing, by ECR plasma, a web of carbon nanofibers or nanotubes on a substrate without any catalyst. In this process, microwave power is injected into a deposition chamber comprising an unbalanced magnetic mirror and at least one ECR zone within the interior of the deposition chamber itself and opposite the substrate. Under a pressure of less than or equal to  $10^{-4}$  mbar, a gas containing carbon is ionized and/or dissociated in the magnetic mirror in a center of the deposition chamber, thus producing species that deposit on the substrate, which is heated, to form the web. A summary of the closest prior art of record follows. Shih et al. (USPN 6,346,303 B1) teaches a method of depositing aligned carbon nanotubes by ECR plasma CVD within the pores (i.e., parallel aligned channels) of a host material. The pores serve as a template so that the carbon precursor plasma deposits as nanotubes on the walls of the pores. The process of Shih et al. does not appear to require any catalyst. However, Shih et al. does not teach or reasonably suggest using an “unbalanced magnetic mirror” to perform the ECR CVD process, as required by the applicant’s claims. Additionally, the carbon nanotubes of Shih et al. are deposited on the walls of the parallel aligned channels of the substrate and therefore form an array of aligned carbon nanotubes, not a web of carbon nanofibers or nanotubes, as required by the applicant’s claims. Yang et al. (USPN 6,420,092 B1) teaches that carbon nanotubes can be deposited by ECR CVD but does not teach or reasonably suggest the specifics of the process (i.e., the deposition of a web of carbon nanofibers / nanotubes, the use of a substrate without any catalyst, the unbalanced magnetic mirror, etc.) claimed by the

applicant. Tennent et al. (USPN 6,099,965), Lavin et al. (USPN 6,426,134 B1), and Smalley et al. (WO 98/39250 A1) all teach pure interconnected carbon nanotube webs, the webs being free of a catalyst, but the webs are not produced by a catalyst-free ECR CVD process, as claimed by the applicant. Mochizuki et al. (USPN 5,433,788), Hirose et al. (USPN 5,685,913), Dandl (USPN 5,370,765), and Delaunay et al. (USPN 4,638,216) all appear to teach "unbalanced magnetic mirror" ECR plasma apparatuses, but none of the references teaches or reasonably suggests performing the applicant's claimed carbon nanotube / nanofiber web deposition process with the apparatus(es). Further, the claims of Delaunay et al. (US 2004/0011291 A1, corresponding to 10/399,175, which does not qualify as "prior art") teach using an unbalanced magnetic mirror ECR CVD process to deposit single-wall carbon nanotubes (SWNTs) on a catalyst-free substrate. However, the aforementioned claims do not teach or reasonably suggest that such a process could or should be utilized to deposit the SWNTs in a web, as required by the claims of the instant application. Since the prior art of record, alone or in combination, does not teach or reasonably suggest each and every limitation of independent Claim 27, this claim is allowed. As Claims 28 – 40 and 57 – 59 depend from Claim 27, these claims are also allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
WDM

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